

CHAPTER TEN
CONTRACTING ISSUES IN MANUFACTURING
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CONTRACTING ISSUES IN MANUFACTURING

OBJECTIVE

The contract is the vehicle used to establish the formal relationship between the government and a prime contractor. There are two basic types of contractual provisions which impact manufacturing—requirements and incentives. Requirements establish minimum levels of performance which the contractor must achieve. Incentives reward the contractor for risk-taking or cost, schedule and technical achievements beyond the minimum requirements of the contract. This chapter will consider five issues which will significantly affect the relationship between the two management teams.

INTRODUCTION

Because the vast majority of defense systems and equipment are produced by contractors, structuring of the contractual relationship is of critical importance. The issues of contracting approach and contract provisions need to be addressed early in the acquisition planning cycle to ensure that proper requirements are generated during each phase of the systems acquisition process and included in the acquisition contracts. This chapter provides information on a number of manufacturing management issues from the perspective of the contract relationship. Each of the topics is independent and no attempt has been made to tie them together. Many of the topics are treated elsewhere in the handbook from a more general standpoint.

MANUFACTURING MANAGEMENT PROGRAM

Aggressive and responsive contractor manufacturing management is essential throughout the acquisition process. Such management does not just happen. Of course, contractor manufacturing management must be considered during the Source Selection process, but more is required to assure a positive ongoing relationship. The contract must define what the government expects from contractor manufacturing management.

One way of defining contractor manufacturing management requirements is to include MIL-STD-1528A, Manufacturing Management Program, in the contract. MIL-STD-1528A requires the contractor to establish and maintain an effective manufacturing management program. The program must provide for detailed planning and control of manufacturing functions and for timely and effective transition from development to full-rate production. The standard also provides for program review and approval by the government. General manufacturing management program goals are defined in Figure 10-1.

Establish and maintain a manufacturing system which provides efficient and effective manufacture of quality hardware.

Increase productivity and reduce production unit cost.

Identify and reduce the impact of critical and strategic materials.

Identify and reduce manufacturing risk.

Plan according to a consistent manufacturing strategy.

Figure 10-1 Manufacturing Management Program Goals

Specific Requirements

MIL-STD-1528A defines specific contractor manufacturing management program requirements in five management areas: planning, design analysis, operations management, system manufacturing assessment, and contractor/government interface. Figure 10-2 outlines the major requirements in each management area.

| Management Area | Requirement |
|---|---|
| Planning | Identify and Obtain Production Resources Identify and Resolve Risk Identify and Obtain Capital Commitments Identify and Obtain Tooling and Test Equipment Verify Manufacturing System Integrate Program and Factory Planning Integrate Make-or-Buy Analysis Integrate Industrial Material Management |
| Design Analysis | Producibility Analysis Process and Methods Analysis Design and Manufacturing Engineering Integration Production State-of-the-Art Analysis |
| Operations Management | Production Scheduling and Control Work Measurement Manufacturing Surveillance Control of Subcontractors and Vendors |
| System Manufacturing Assessments | Manufacturing Feasibility Manufacturing Capability |
| Contractor/Government Interface | Manufacturing Management Program Review Manufacturing Management/Production Capability |

Figure 10-2, MIL-STD-1528A Requirements

INCENTIVE STRUCTURES

Another vital element is contractor motivation. Contractual structure motivates contractors by providing the opportunity to earn larger profits through improved performance, effective cost control, reduced lead time, and new or additional efforts that would not have occurred without the incentives. Different types of incentives may be appropriate at different times during system development and/or production. Incentive structures may be divided into contract type and contract provisions that can be used regardless of contract type. Figure 10-3 depicts several important manufacturing management elements commonly considered in contract incentive structures.

| Cost | Schedule | Technical |
|--|--|--|
| Cost Reduction Design-to-Cost Life-Cycle Cost | Expedited Development Early Delivery On-Time Delivery | Quality Reliability Maintainability Product Improvement |

Figure 10-3 Incentive Improvement Goals

Contract Types

The primary means of motivating contractor performance is through appropriate selection of contract type. There are two basic contract types, fixed price and cost reimbursement but there are several variations of each. The most common fixed price contracts are Firm Fixed Price (FFP) and Fixed Price Incentive Firm (FPIF). The most common cost reimbursement contracts are the Cost Plus Fixed Fee (CPFF), Cost Plus Incentive Fee (CPIF), and Cost Plus Award Fee (CPAF).

There are two major differences between fixed price contracts and cost reimbursement contracts. The differences relate to the contractor's acceptance of performance risk and cost risk. Under a fixed price contracts the contractor assumes substantial performance risk. The contractor is required to deliver the specified product or service; and final payment is not made until after final delivery. Under a cost reimbursement contract, the contractor is only required to deliver a best effort to complete the contract. Cost risk assumption is related to assumption of performance risk. Normally under a cost reimbursement contract, fee may increase or decrease based on performance, but all allowable costs are reimbursed up to the maximum amount specified in the contract. All fixed price contracts include a maximum amount that the government may be obligated to pay. If contractor costs plus profit exceed this amount, the government is not obligated to pay more than this maximum. Additional costs come from contractor resources. Contract type selection should be based on the amount of performance/cost risk involved and the ability of the contractor to control that risk.

In an FFP contract, a firm price is set at the beginning of the contract. All cost risk is assumed by the contractor. In such situations, the contractor should have the maximum motivation to control cost. This type of contract should be used in situations where performance and cost risk are relatively low, predictable, and controllable by the contractor. In follow-on production, for example, where specifications and work methods are set, an FFP contract would normally be the preferred choice.

In situations involving greater risk, FPIF or CPIF contracts provide contractor incentives to control costs while sharing cost risk with the government. Both types have target costs and government/contractor cost sharing arrangements if costs are above or below those targets. If costs are less than target cost, contractor profit (fee in cost contracts) increases. If costs are more than target cost, contractor profit/fee decreases. FPIF contracts include a ceiling price. If total cost and profit reach this ceiling price, the contractor must assume all cost responsibility. CPIF contracts include a maximum and minimum (which may be negative) fee. Cost responsibility remains with the government. In general the FPIF contract would be used in situations where specifications and methods are somewhat defined, but substantial risk remains. CPIF contracts should be used where cost control is important but there is less overall definition. The amount of risk and contractor ability to control that risk should be the determining factor. A CPIF contract might be used for developmental units. An FPIF contract could be used for initial production after development.

While FPIF and CPIF contracts always include a cost incentive, they may include multiple incentives covering areas such as schedule performance, technical performance and others. Each incentive may be weighted by relative importance. One caveat — as many incentives are combined within an individual contract, the resulting complexity may defeat the purpose of the incentive. The goal of the incentive is to motivate contractor effort in a specific direction. Highly complex incentive structures often defeat this goal because the contractor is unable to

determine, at any point in time, the behavior that is most likely to result in earning higher profits. This occurs because behavior that may improve the likelihood of earning one part of the incentive may lead to outcomes which reduce the potential in other areas. For example, design efforts to obtain better technical performance may result in higher costs and schedule delays.

A CPAF contract provides a means of applying incentives in contracts which are not susceptible to the finite measurement of performance necessary for structuring other incentives. The fee established in a CPAF contract consists of a fixed amount called the base fee which does not vary with performance, and an award fee amount for excellence in contract performance in areas such as quality, manufacturing technology implementation, and management ingenuity. Award fee provisions involve the subjective measurement of performance. The amount of award fee to be paid is based upon a subjective evaluation by the government of contractor performance, judged in the light of criteria set forth in the contract. The number of criteria used and the requirements which are represented will differ widely from one contract to another. CPAF contracts have been used to motivate contractors achievements in design to cost, design to life cycle cost, reliability and maintainability improvement and other areas where incentive goals may not be precisely definable at the outset of the contract.

A CPFF contract provides no direct profit incentive to the contractor. A fixed fee is negotiated at the outset and remains fixed regardless of cost or performance. Still there are indirect incentives. In research and development efforts, for example, contractors are motivated to accept risky contracts to do such things as develop state-of-the-art systems. The motivator is the potential for future development and/or production contracts.

Contract Provisions

In addition to incentives provided by the various types of contracts, there are a variety of contract provisions that may be included in contracts to motivate contractors toward desired objectives. Three of the most important are value engineering, warranty, and capital investment incentive provisions.

Value engineering provisions may be included in contracts to reward voluntary value engineering suggestions or to require value engineering analysis to identify methods of performing more economically. Value engineering attempts to eliminate, without impairing essential functions or characteristics, anything that increases acquisition, operation, or support costs. Value engineering is discussed in greater detail in Chapter 7.

Warranties are required on all weapons systems with a unit cost of \$100,000, or total procurement cost of \$10,000,000. Prime contractors must certify in writing that weapons systems provided conform to contract requirements, are free from defects, and meet performance requirements. If units fail to meet requirements the government may require the contractor to: repair or replace the item; reimburse the government for the cost of repair; or equitably reduce the contract price considering the cost of repair.

Capital investment incentives are included as a major part of DOD profit analysis. Industrial modernization incentives also may be negotiated and included in contracts for research, development, and/or production of weapons systems, major components, or materials. The purpose is to motivate the contractor to undertake productivity improvement efforts it would not have otherwise undertaken or to invest earlier than otherwise planned. More details on the Industrial Modernization Incentives Program (IMIP) may be found in Chapter 5 and 8.

MAKE-OR-BUY PROGRAM

The prime contractor is responsible for managing contract performance, including planning, placing, and administering subcontracts as necessary to ensure the lowest overall risk to the government. Although the government does not expect to participate in every management decision, it may reserve the right to review and agree on the contractor's make-or-buy program when necessary to ensure: negotiation of reasonable contract prices; satisfactory performance; or implementation of socio-economic policies. A make-or-buy program is a contractor's written plan identifying major items to be produced or work efforts to be performed in the prime contractors facilities, and major items to be contracted.

Make-or-buy programs are required only where the work is complex, the dollar value is substantial, and

price competition is lacking. Regardless of the type of contract intended, prospective contractor make-or-buy program information is required for all negotiated procurements except when the proposed prime contract:

- 1) Is estimated to be less than \$2 million;
- 2) Is for research and development, unless the contract is for prototypes or hardware and it can reasonably be anticipated that significant follow-on quantities of the product will be procured.
- 3) Is determined by the contracting officer to be priced based on adequate price competition, or established catalog or market prices of items sold in substantial quantities to the general public, or on prices set by law or regulation; or
- 4) Involves only work that the contracting officer determines is not complex.

Contractor Actions

In responding to the solicitation, the contractor identifies in the proposed make-or-buy program work categorized as “must make,” “must buy,” or “can make or buy.” A make item is one produced, or work performed, by the contractor or its affiliates, subsidiaries, or divisions. The information required to support this determination is detailed in Figure 10-4.

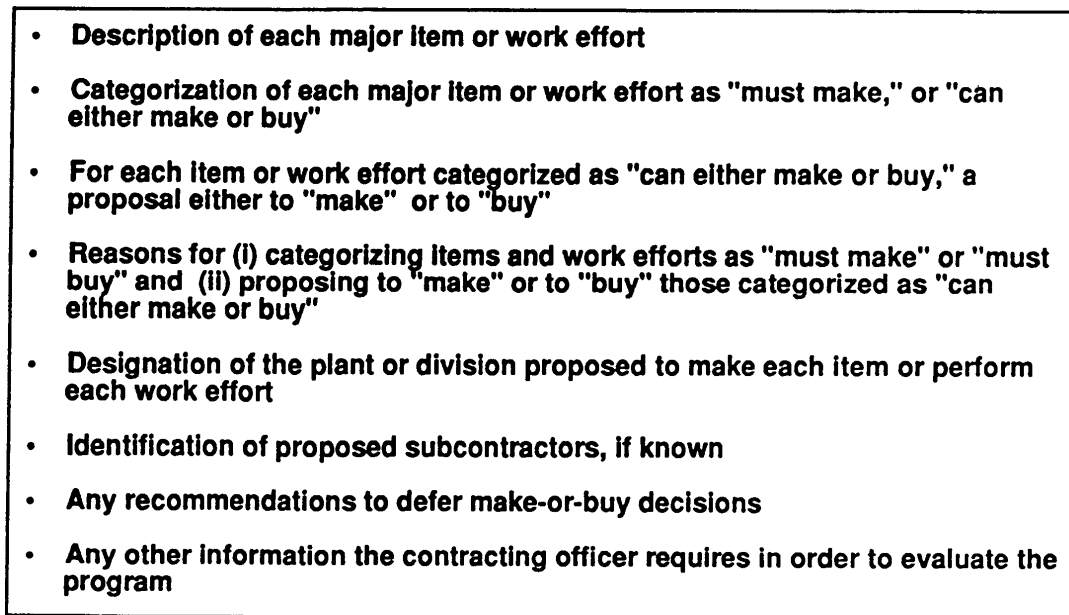
- 
- **Description of each major item or work effort**
 - **Categorization of each major item or work effort as "must make," or "can either make or buy"**
 - **For each item or work effort categorized as "can either make or buy," a proposal either to "make" or to "buy"**
 - **Reasons for (i) categorizing items and work efforts as "must make" or "must buy" and (ii) proposing to "make" or to "buy" those categorized as "can either make or buy"**
 - **Designation of the plant or division proposed to make each item or perform each work effort**
 - **Identification of proposed subcontractors, if known**
 - **Any recommendations to defer make-or-buy decisions**
 - **Any other information the contracting officer requires in order to evaluate the program**

Figure 10-4 Contractor Make-or-Buy Program Support

Government Evaluation

Contracting officers must evaluate and negotiate proposed make-or-buy programs as soon as practicable after their receipt and before contract award. In preparing to evaluate and negotiate prospective contractor's make-or-buy programs, the contracting officer must request the recommendations of appropriate personnel, including technical and program management personnel, and the small and disadvantaged business utilization specialist.

In the evaluation, primary consideration must be given to the effect of the proposed make or buy program on total contract price, quality, delivery, and performance. Socioeconomic considerations, such as labor surplus area and small business support, must also be considered. The government will not normally agree to proposed “make items” when the products or services are (1) not regularly manufactured or provided by the contractor and are available from another firm at equal or lower prices or when they are (2) regularly manufactured or provided by the contractor, but available from another firm at lower prices.

Post Award Changes

In addition to special provisions containing the make-or-buy program features, the FAR clause 52.215-21, “Changes or Additions to Make or Buy Program,” must be included in the contract. This clause describes procedures that must be followed to make changes to the make-or-buy program described in the contract.

SUBCONTRACT MANAGEMENT

The prime contractor is responsible for managing the planning, placing, and administering of subcontracts. Make-or-buy program analysis considers the prime contractor’s decisions in determining if certain components or services will be subcontracted. In this section, we will consider means available to the government to evaluate how those decisions are implemented.

Weapon systems contractors have always needed support from other firms in meeting their contractual obligations. Prime contractors must purchase a wide variety of raw materials, parts, subassemblies, and services. While definitions vary, we will consider all these suppliers as subcontractors.

In this age of increasing specialization, prime contractor reliance on subcontractors has become increasingly important. Typically, one-third to two-thirds or more of total prime contract dollars are eventually paid to subcontractors. Effective management of subcontractors therefore becomes essential to effective contract performance. As a result more government attention is being directed toward the prime-subcontractor relationship.

Special care must be exercised when considering government involvement in this relationship. The government has no privity of contract (direct contractual relationship) with subcontractors. Any government efforts to control subcontractors must be accomplished by affecting the prime contractor’s management of subcontracts. Subcontractors should not be asked or expected to follow government direction. If they do and problems result, the government will likely be open to substantial claims from both the prime and subcontractors. Remember also that prime contractors are paid to manage the entire contract effort including subcontractors.

In addition to make-or-buy program analysis, examined in the last section, government involvement in subcontracting has traditionally centered on consent to subcontract and contractor purchasing system review (CPSR). Increasingly, the government is also becoming directly involved in supporting prime contractor subcontract management by directly participating in prime contractor evaluation of subcontractors.

Consent

Government consent to subcontract placement may be required when subcontract work is complex, the dollar value is substantial, or the Government’s interests are not adequately protected by competition and the type of prime contract or subcontract. The consent requirement is implemented through the subcontract clause in the prime contract. This consent does not establish any direct contract relationship between the government and the subcontractor nor does it relieve the prime contractor of any responsibility for selection and management of subcontractors.

Contractor Purchasing System Review

The Contractor Purchasing System Review provides the Administrative Contracting Officer (ACO) with the information needed to grant, withhold, or withdraw approval of the contractor’s purchasing system. The CPSR objective is to evaluate the efficiency and effectiveness with which the contractor spends government funds and complies with government policy when subcontracting. Approval of the contractor’s purchasing system significantly reduces requirements for review and consent to individual subcontracts.

All contractors with more than \$10 million annually in negotiated government contracts are subject to CPSRs. Procedures call for an intensive initial review with annual surveillance using on-site visits and more detailed subsequent reviews in alternate years. These reviews devote special attention to the items identified in Figure 10-5.

- **Degree of price competition obtained**
- **Pricing policies and techniques**
- **Methods of evaluating subcontractor's responsibility**
- **Treatment accorded affiliates and other concerns having close working arrangements with the contractor**
- **Policies and procedures pertaining to labor surplus area concerns and small business concerns**
- **Planning, award, and postaward management of major subcontract programs**
- **Compliance with Cost Accounting Standards in awarding subcontracts**
- **Appropriateness of types of contracts used**
- **Management control systems, including internal audit procedures, to administer progress payments**

Figure 10-5 Contractor Purchasing System Review Special Concerns

Subcontractor Evaluation Support

Because subcontractors are performing larger and larger portions of contract effort, government organizations are becoming more directly involved in prime contractor evaluation of subcontractor cost and price proposals and subcontractor ability to manufacture systems. Government personnel have participated as team members in prime contractor Should Costs, Manufacturing Management/Production Capability Reviews (MM/PCRs), and Production Readiness Reviews (PRRs) at subcontractor facilities. Government participation is based on government responsibility to evaluate the total contract effort and special provisions in the prime contract.

CONTRACTOR DATA

Manufacturing Management activities require accumulation and manipulation of large amounts of data. To properly manage system development and production, the government must obtain and evaluate this information particularly: manufacturing management data; progress reporting data; and technical data.

Data Requirements Definition

Requirements to perform work tasks such as manufacturing analyses, reviews, and preparation of plans, which result in the generation of data, must appear in the contract Statement of Work (SOW). These SOW requirements are based on the need to manage or support the manufacturing function as well as overall program management requirements. Data are generated by and directly traceable to the technical requirements or other work effort established in the SOW.

While the SOW sets forth the contractual tasks required, an attachment or exhibit to the contract called the Contract Data Requirements List (CDRL), DD Form 1423, contains the list of data required to be delivered under the contract. Properly developed, the CDRL permits DOD managers to attain the data objectives described in Figure 10-6.

- **Specify the minimum amount of data needed**
- **Identify individual data item prices**
- **Assure on-time acquisition of required data**
- **Establish data requirements to meet manufacturing management needs**
- **Specify data requirements in solicitations or proposals to provide full, understanding of total data requirements at contract award**
- **Provide for administration of contracts requiring data to ensure that all contract data provisions are fully satisfied**
- **Provide quality assurance procedures to ensure the adequacy of the data for its intended purpose**
- **Provide for the continued currency of acquired data**
- **Prevent the acquisition of duplicate data**

Figure 10-6 Contract Data Requirements List Data Objectives

The CDRL should contain an explanatory Data Item Description (DID) for each data item listed. DIDs specifically describe the purpose of the data item, applications involved, interface references, and data preparation requirements. Accordingly, they play a key role in obtaining needed information in such critical areas as production plan development and execution, production capability and feasibility assessments, production readiness review accomplishment, production progress reporting and engineering data.

An individual DID is required for each data element. Detailed DIDs are listed in the DOD Acquisition Management Systems and Data Requirements Control List (AMSDDL), DODD 5000.19L, Volume 11. If a particular data requirement is not listed in the AMSDDL, special Service or Agency approval will be required.

There is considerable latitude in the amount of information or data to be obtained under the various contract vehicles. Manufacturing data content and format should be tailored for each program phase. Tailoring is basically the exclusion of those sections, paragraphs, or sentences of standards, specifications or data items and the substitution thereof, addition, or creation of specific data requirements to meet the needs of manufacturing managers.

Manufacturing Management Data Items

The need for manufacturing data exists throughout the product life cycle and can be defined as recorded information, regardless of form or characteristic, which may be retained by the contractor or provided to the government. Whether retained and made available for review or provided, data may be necessary for any number of purposes including those listed in Figure 10-7.

- **Preparation for quantity manufacturing**
- **Design adequacy review**
- **Manufacturing feasibility**
- **Manufacturing capability**
- **Program visibility**
- **Risk assessment**
- **Discipline interfacing**
- **Manufacturing planning**
- **Facilities planning**
- **Subcontractor management**
- **Manufacturing surveillance**

Figure 10-7 Typical Manufacturing Management Data Items

Progress Reporting

A number of different techniques and reports are utilized by program managers to obtain status on manufacturing efforts. These include: Cost Performance Reports (CPR); Cost/Schedule Status Reports (C/SSR); Production Progress Reports (PPR); Line of Balance (LOB); Performance Evaluation and Review Technique (PERT)/Critical Path Method (CPM) reports; Gantt or phase-planning charts; and internal contractor management information system outputs. No one technique is applicable to all programs or program phases.

The information generated is targeted for use at different levels of program management, procuring agency, or contract administration office. System requirements, such as the Cost/Schedule Control System Criteria (C/SCSC), are intended to provide criteria for the management system from which data will be generated for management visibility in five areas: organization, planning and budgeting, accounting, analysis, and revisions. Other requirements, such as PERT/CPM and Gantt charts, are intended to ensure that manufacturing progress is commensurate with the contract schedule. This topic is treated in detail in Chapter 13.

Technical Data

The term technical data is defined as recorded information, regardless of the form or method of the recording, of a scientific or technical nature (including computer software documentation). The term does not include computer software or data incidental to contract administration, such as financial and/or management information. Examples of technical data include: research and engineering data; engineering drawings and associated lists; specifications; standards; process sheets; manuals; technical reports; catalog identifications and related information; and documentation related to computer software.

The Government has extensive needs for many kinds of technical data and the rights to use such data. Its needs may well exceed those of private commercial customers. For defense purposes, millions of separate equipment and supply items, ranging from standard to unique types, must be acquired, operated, and maintained, often at points remote from the source of supply. Functions requiring varied kinds of technical data are described in Figure 10-8.

| | |
|------------------------------|-------------------------------|
| • PERSONNEL TRAINING | • INSPECTION |
| • OVERHAUL AND REPAIR | • PRODUCT SURVEILLANCE |
| • CATALOGING | • PACKAGING |
| • STANDARDIZATION | • LOGISTICS OPERATIONS |
| • MODIFICATION | • REPROCUREMENT |
| • INTERFACE CONTROL | • SERVICE TEST |

Figure 10-8 Uses of Technical Data

There is not necessarily a correlation between the Government's need for technical data and the contractor's economic interest in such data. Commercial and non-profit organizations have property rights and a valid economic interest in technical data pertaining to items, components, or processes which they have developed at their own expense. Such technical data are often closely held in the commercial sector because their disclosure to competitors could jeopardize the competitive advantage they were developed to provide. Public disclosure of such technical data could cause serious economic hardship to the originating company and would not be in the interest of the United States in encouraging innovation as well as encouraging contractors to develop at private expense items, components, or processes for use by the government.

Because of the possible different government/contractor views on technical data, it is particularly important for the government to identify its various uses of and needs for technical data as early as is practicable in the acquisition of any item, component, or process. Such identification should be made before contract award or, for major weapons systems, prior to entering full-scale development. It is also important that contractors be required to provide early identification of any technical data that they intend to deliver with any restrictions on Government use.

Normally, delivery of the technical data package occurs at the end of full-scale development or during the production phase. Timing of the delivery is based on the planned use of the data and the expected magnitude of design changes during the early part of the production phase.

Of all these uses, the one which provides the greatest difficulty is reprocurement. If DOD wishes to acquire systems or spare and repair parts for the systems under competitive procedures, unlimited rights in data is normally required. Conflict with contractor economic interest is obvious. Most contractors are not anxious to support future competition. The technical data package for reprocurement needs to contain the information necessary to enable a competent manufacturer to build the part or component. This should include such items as: purchase specifications, inspection and test requirements, and packaging data. Special care should be taken to assure that data packages do not contain restrictive markings. Data packages must include explanations of references such as contractor specification numbers.